2003 ARCHER'S FURBEARER POPULATION INDEX

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ABSTRACT

A random sample of archers was contacted prior to the 2003 archery deer hunting season and asked to record numbers and types of furbearers observed while deer hunting during the early archery season (October 1-November 14). The most frequently observed furbearers were raccoon and coyote. Indices for the muskrat populations were highest in the southern Lower Peninsula (SLP), and indices for wolves, fisher, and moose were highest in the western Upper Peninsula (WUP). Confidence limits associated with statewide indices usually were $\geq 30\%$ of the estimate for most species. Consequently, comparisons made using these indices must be viewed cautiously. Increasing the sample size from 400 to 3,000 would be expected to reduce the confidence limits of the indices to about 20% of the statewide index for the common species.

INTRODUCTION

The Michigan Department of Natural Resources (MDNR) has the authority and responsibility to protect and manage the wildlife resources of the State of Michigan. Wildlife population surveys are one of the management tools used by the Wildlife Division to accomplish its statutory responsibility.

Many types of data correlated to animal abundance can be used as a population density index. Indices do not provide estimates of actual numbers of animals, but rather it provides relative density estimates. Wildlife biologists often desire to monitor populations of animals over large areas. Population indices are widely used in these extensive monitoring programs because they are inexpensive compared to estimates of absolute abundance.

The main objectives of the archer's furbearer index were to monitor furbearer status and distribution. Information obtained from the archer's furbearer index, as well as harvest

estimates, could be used to monitor furbearer populations and help establish harvest regulations. In addition, the information from this pilot study will be used to refine this survey so that future indices have sufficient statistical power to reliably detect real population changes.

METHODS

A sample of randomly selected archers was contacted prior to the 2003 archery deer hunting season and asked to record numbers of furbearers observed while deer hunting during the early archery season (October 1-November 14). The state was divided into three strata. One stratum included Baraga, Gogebic, Houghton, Iron, Marquette, and Ontonagon counties in the western Upper Peninsula (WUP). The second stratum included Clare, Crawford, Manistee, Missaukee, and Roscommon counties in the northern Lower Peninsula (NLP). The third stratum included Allegan, Barry, Jackson, and Washtenaw counties in the southern Lower Peninsula (SLP). Only archers that hunted in at least one of three areas (strata) were chosen for the sample. In addition, archers included in the sample had reported hunting at least 10 days during previous years.

The random sample of archers was obtained from lists of people who indicated they had hunted in the WUP stratum during 2001-2002, or in the NLP or SLP strata during 2002. These lists represented randomly selected people included in annual deer harvest surveys that were conducted by the Wildlife Division (Frawley 2002, 2003). An estimated 7,587 archers had hunted at least 10 days in the WUP, while 17,626 and 11,922 archers had hunted in the NLP and SLP strata, respectively (unpublished data, Wildlife Division).

A data reporting form was sent to 1,243 randomly selected archers. This sample included 426 archers from the WUP, 417 from the NLP, and 400 from the SLP. These archers were asked to report for each day they hunted, the numbers and types of furbearers observed, the hours of observation, and the county where the observations occurred.   Archers also were provided information to help them identify mink, martin, fisher, bobcat, and lynx.

Indices were presented as the mean number of furbearers observed per 100 archers. These indices were subject to sampling errors because they were collected from random samples of archers (Cochran 1977). These indices were calculated using a stratified random sampling design (Cochran 1977) and were presented along with their 95% confidence limit (CL). In theory, this confidence limit can be added and subtracted from the estimate to calculate the 95% confidence interval. The confidence interval is a measure of the precision associated with the estimate and implies that the true value would be within this interval 95 times out of 100. Unfortunately, there are several other possible sources of error in surveys that are probably more serious than theoretical calculations of sampling error. They include failure of participants to provide answers (nonresponse bias) and misidentification of animals. It is very difficult to measure these biases; thus, indices were not adjusted for these possible biases.

The estimated indices and variances (i.e., measures of the variability in the population) from this project were used to evaluate sample size requirements for future studies (Cochran 1977). Sample sizes were calculated for various levels of precision (i.e., measures of how close estimates are expected to be to the true value of a parameter), assuming a stratified sampling design.

Archers were initially contacted during late September 2003. A reminder note was mailed to archers in mid-November reminding them to return their observation reports by December 1, 2003. The data reporting form was sent to 1,243 people, but 10 data forms were undeliverable resulting in an adjusted sample size of 1,233. Questionnaires were returned by 412 people, yielding a 33% adjusted response rate.

RESULTS

Raccoon and coyotes were the most commonly observed furbearers reported by archers in 2003 (Figures 1 and 2, Table 1). Hares were the next most abundant species; however, many of these observations were probably cottontail rabbits because hares are not present in all regions that were sampled.

Indices were poorly estimated for most furbearers; thus, few indices differed by region (Figures 1 and 2, Table 1). Furthermore, archers often failed to report the county where they observed furbearers so many observations could not be included in regional estimates. Despite these problems, the indices for the muskrat populations were highest in the SLP, and the indices for wolves, fisher, and moose were highest in the WUP.

Confidence limits associated with statewide indices usually were $\geq$30% of the estimate for all species except raccoon, coyotes, and fox (Figures 1 and 2, Table 1). Furthermore, about 67% of the archers selected for our sample never reported their observations. Thus, the effect of nonresponse biases may be severe. Consequently, comparisons made using these estimates must be viewed cautiously. Increased numbers of archers would need to be contacted to improve the precision of indices. Increasing the sample size from 400 to 3,000 would be expected to reduce the confidence limits of the indices to about 20% for the common species (Table 2). Additional efforts will need to be made to improve rates of participation among sampled archers in order to reduce nonresponses biases.

ACKNOWLEDGEMENTS

LITERATURE CITED

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Figure 1. Mean number of furbearers observed per 100 archers during the early archery season (October 1-November 14, 2003), summarized by hunting region. Error bars represent the 95% confidence limits.

Figure 2. Mean number of furbearers observed per 100 archers during the early archery season (October 1-November 14, 2003), summarized by hunting region. Error bars represent the 95% confidence limits.
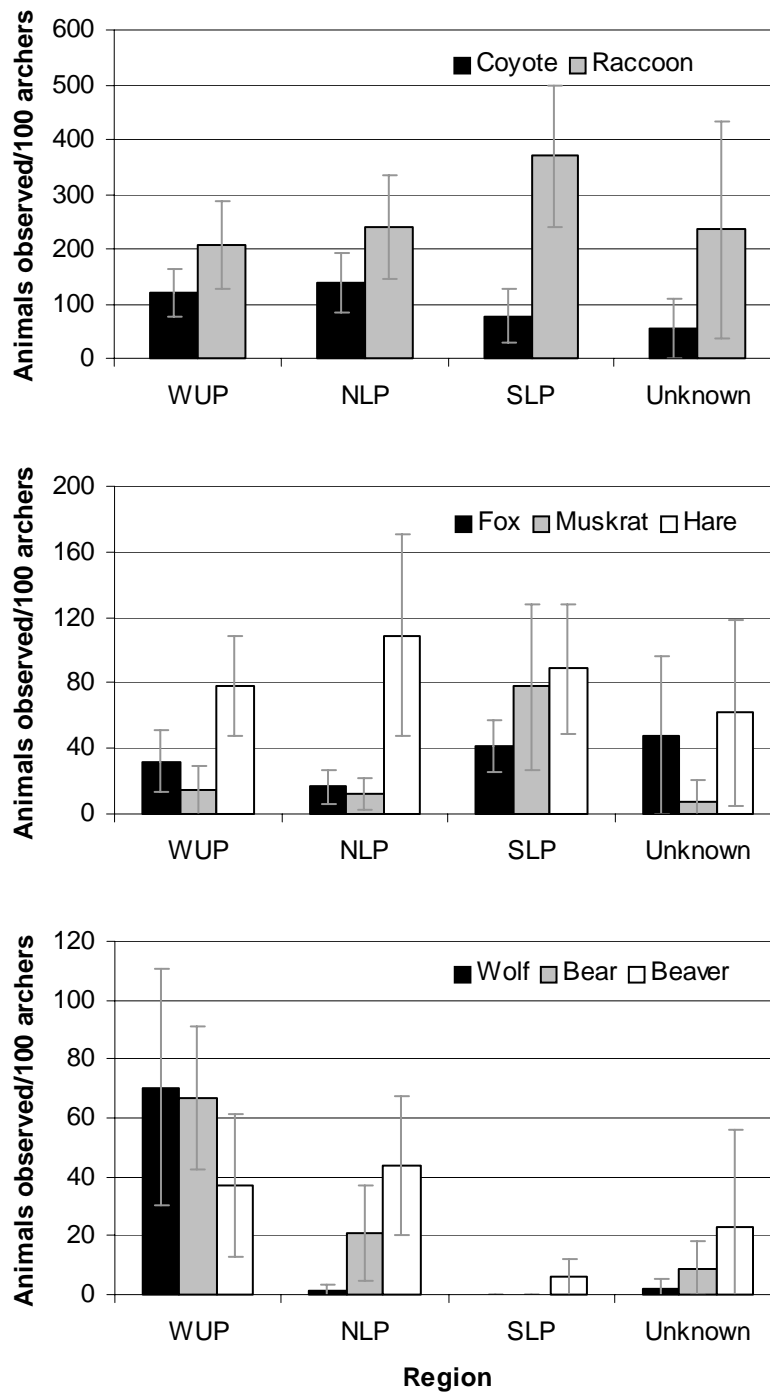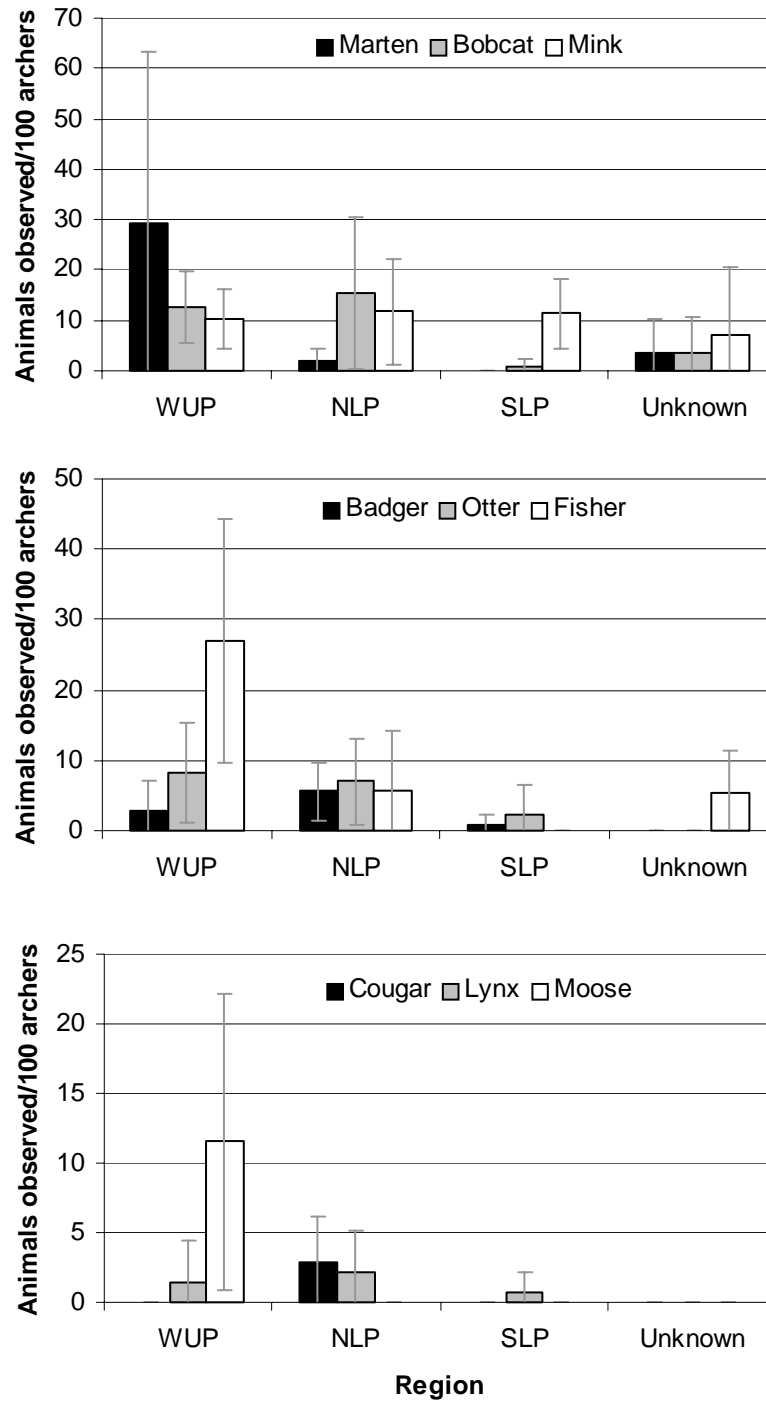
Table 1. Mean number of furbearers observed per 100 archers during the early archery season (October 1-November 14, 2003), summarized by hunting region and statewide.

| | Ecological Region | | | | | | | | | |
| | WUP | | NLP | | SLP | | Unknown | | Statewide | |
Species	Mean	95% CL	Mean	95% CL	Mean	95% CL	Mean	95% CL	Mean	95% CL
Badger	3.0	4.1	5.6	4.2	0.7	1.5	0.0	0.0	3.6	2.3
Bear	66.7	24.2	20.9	16.2	0.0	0.0	9.0	8.9	25.7	9.6
Beaver	37.1	24.5	44.1	23.6	5.8	6.5	22.9	32.9	33.5	13.5
Bobcat	12.6	7.0	15.3	15.1	0.7	1.5	3.6	7.1	10.7	7.3
Cougar	0.0	0.0	2.8	3.3	0.0	0.0	0.0	0.0	1.3	1.6
Coyote	120.4	43.6	137.2	55.3	77.0	48.9	55.0	54.3	126.7	36.0
Fisher	26.9	17.4	5.6	8.6	0.0	0.0	5.5	6.0	9.2	5.7
Fox	32.2	18.9	16.5	9.9	41.5	15.5	47.8	48.0	35.7	9.9
Hare	77.6	30.6	109.1	61.3	88.6	39.9	61.9	56.9	109.1	34.5
Lynx	1.5	2.9	2.1	3.0	0.7	1.5	0.0	0.0	1.6	1.7
Marten	29.3	33.8	2.1	2.3	0.0	0.0	3.5	6.8	7.9	7.9
Mink	10.4	5.9	11.8	10.5	11.3	6.9	7.1	13.6	13.0	5.9
Moose	11.5	10.7	0.0	0.0	0.0	0.0	0.0	0.0	2.6	2.4
Muskrat	14.1	15.5	12.5	9.8	77.5	50.8	7.1	13.6	40.1	20.8
Otter	8.2	7.1	7.0	6.0	2.2	4.4	0.0	0.0	6.0	3.7
Raccoon	208.8	79.7	240.7	94.4	370.1	129.6	235.6	198.4	326.9	75.7
Wolf	70.3	40.2	1.4	1.9	0.0	0.0	1.8	3.5	16.7	9.2

Table 2. Number of archers in sample required to achieve various levels of precision (relative error) for a statewide index of abundance.

Species	Relative error (%)						
	5%	10%	15%	20%	25%	30%	35%
Badger	24,630	11,647	6,200	3,747	2,483	1,759	1,308
Bear	14,169	5,015	2,415	1,399	908	635	469
Beaver	16,055	5,797	2,808	1,630	1,059	742	548
Bobcat	27,910	13,462	7,227	4,384	2,911	2,064	1,536
Cougar	38,238	25,692	16,609	11,110	7,793	5,709	4,339
Coyote	10,203	3,130	1,452	830	535	373	275
Fisher	21,582	10,670	5,791	3,530	2,351	1,669	1,243
Fox	9,796	2,985	1,383	790	509	355	261
Hare	12,097	3,827	1,789	1,025	661	462	340
Lynx	32,261	20,916	13,187	8,691	6,042	4,402	3,333
Marten	31,269	19,935	12,427	8,137	5,635	4,096	3,097
Mink	18,940	7,090	3,471	2,024	1,318	924	683
Moose	22,018	15,167	9,988	6,757	4,773	3,512	2,676
Muskrat	21,215	8,789	4,447	2,629	1,723	1,213	898
Otter	23,532	11,035	5,854	3,532	2,339	1,656	1,231
Raccoon	7,432	2,149	983	559	360	250	184
Wolf	17,120	8,543	4,656	2,844	1,896	1,347	1,003